

Rebuttal Report

Review of Principal Components Analysis of Data and Review of Inferences about Presence of Biomarkers in the Population of Animals from the Illinois River Watershed

Prepared for:

Tyson Foods, Inc.
Tyson Poultry, Inc.
Tyson Chicken, Inc.
Cobb-Vantress, Inc.
Cal-Maine Foods, Inc.
Cal-Maine Farms, Inc.
Cargill, Inc.
Cargill Turkey Production, LLC
George's, Inc.
George's Farms, Inc.
Peterson Farms, Inc.
Simmons Foods, Inc.
Willow Brook Farms, Inc.

Prepared by:

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San Antonio, TX 78249

November 26, 2008



Charles D. Cowan, Ph.D.

EXHIBIT

"A"

**REBUTTAL REPORT
REVIEW OF PCA AND PROJECTABILITY OF BIOMARKER INFERENCES FROM THE ILLINOIS RIVER WATERSHED**

PERSONAL SUMMARY

1. My name is Charles Cowan. I reside in San Antonio, TX. I was retained by the defendants to provide an opinion regarding the use of principal components analysis by Dr. Olsen for this litigation and the statistical reliability and value of sampling used both by Dr. Olsen and Dr. Harwood. I have personal knowledge of the matters contained in this report.

Education and Experience

2. My background covers 30 years of research and study in the areas of statistics, economics, and their application to business problems. I am Managing Partner of Analytic Focus LLC, a company headquartered in San Antonio, TX and with offices in Birmingham, Alabama and Washington, DC. A portion of our work is conducting research for legal matters, including providing litigation support and expert witness services when requested. Some of our work focuses on measurement and mitigation of risk for financial intermediaries. The final area of our practice is in support of Federal and State agencies needing economic and financial analysis to pursue their missions. Prior to starting Analytic Focus LLC I served as Chief Statistician for the Federal Deposit Insurance Corporation. I was also a Director for Price Waterhouse where I headed the Financial Services Group in the Quantitative Methods Division. I served for 12 years at the U.S. Bureau of the Census where I was responsible for the evaluation of the Decennial Census and held the title of Chief of the Survey Design Branch.

3. I am currently an adjunct professor in the School of Public Health at the University of Alabama – Birmingham (UAB) and previously served as a professor in the Business School at UAB, as a visiting research professor at the University of Illinois, and in other academic and professional positions.

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Non-Detects

57. In the data analyzed by Dr. Olsen, he also has a number of values that are non-detects, meaning the measurement method used by the researchers cannot measure any trace measure of a chemical or organic value. Rather than treat this as a zero (not detected), Dr. Olsen substitutes the midpoint between zero and the detect limit for a chemical⁹. However, the detect limits can vary from observation to observation for each chemical. In some samples we would have a smaller non-detect than for others, such as .01 as a lower limit for some observations on Aluminum, and .001 for other lower limits. This variability in detection levels adds to the variability in the data, exacerbated by the use of logarithms. This is another method of treatment of missing data, but the impact will be discuss later in this report.

USGS vs. non-USGS observations

58. As noted previously, Dr. Olsen takes observations from the USGS¹⁰ and combines them with observations from the plaintiffs and treats them all as if they are measuring the same relationships, but he does so without testing if there is a difference between the two datasets.

59. **This is the seventh key problem in Dr. Olsen's analysis.** Ignoring the sources of the data ignores any incompatibility in the data. The table below replicates Dr. Olsen's analysis exactly for the PCA, but conducts his analysis twice – once for the USGS cases and once for the non-USGS cases. The rotated factors are presented.

⁹ CDM Report page 6-40 and page 6-47

¹⁰ CDM Report, page 5-1 and page 6-38

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72. There are other problems with the use of logarithms. One is that, in trying to fit a relationship between two variables, observations receive different weight for their contribution to the relationship if log values are used compared to when the original values are used. This means that there are values that will have a strong effect on the outcomes when used as an actual value. The same values will not have an effect on the outcomes if logged, while other observations will have a stronger effect than would have happened with the original data. Because of this, use of logarithms has to be done with great caution since the interpretation of the value of the inputs differs greatly. A particular example of this is found in the non-detects.

73. As noted before, the **non-detects** have their importance greatly heightened in the analysis. The logarithm of a number is the exponent of the number represented as raised to the power of ten. The table below demonstrates what the values are:

Number	0.000001	0.0001	0.01	1	100	10000	1000000
Equals	10^{-6}	10^{-4}	10^{-2}	10^0	10^2	10^4	10^6
Logarithm	-6	-4	-2	0	2	4	6

74. A non-detect of .01 versus a non-detect of .001 might not seem like much a difference, but in the log scale this can be the difference between -2 and -3. If the variable being measured typically has values in the range of 10 to 100 milliliters, the value being analyzed on the log scale is somewhere in the range of 1 to 2. A change in the non-detect value of -2 to -3 (merely because of very minor differences in the test) will have huge effects on the outcome.

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REPRODUCING THE SW3 DATA RECORDS AND VALUES

79. Dr. Olsen used a program called EDA_Analyzer to capture the data from the main database and loaded the data into an Excel worksheet referred to as SW3. It appears that he substitutes means for the missing values (see the earlier discussion in this report on this point). Dr. Olsen then takes logarithms of the SW3 values before using Systat to calculate PCA loadings (coefficients). The results of the Systat loading coefficients are transferred to an Excel sheet and he calculates the PCA values presented in Appendix F of the CDM report¹³.

80. We attempted to reproduce the values in the SW3 Excel sheet and the PCA values in Appendix F of the CDM report. All of the records from the master database with "SW:S" in the sample groups were downloaded into an Excel file. This download produced an Excel sheet with all of the surface water data. We had to make some changes in sample group identifications to match the EDA_Sample IDs found in Appendix F of the CDM report. Some of the changes were to add USGS to the sample group IDs that only had numbers. There were other changes made to the sample group IDs that involved removing blank spaces and changing noncapital letters to capital letters. This work was required to be able to finally link the values reported by Dr. Olsen in his written report to the same values in Dr. Olsen's data – there was little correspondence between values in the written report and the database and it required a significant effort to be able to link which data records Dr. Olsen selected from all of those available. I revisit this topic later as there seems to be little consistency in choices made for the data ultimately included in the analysis. We picked the appropriate measurement unit for values that were measured in UG/L units and we used the P0065 measurement values for the USGS variables TKN, TDS, SO4, P_TD, P_T and P_SOL_REAC.

¹³ CDM Report, page 6-53

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Dr. Olsen's SW3 data	13,983 values + 915 missing values = 14,898 values
Analytic Focus	12,933 matched data values (Agreement with Olsen)
+	849 matched missing values (of the 915) (Agreement with Olsen)
+	499 missing values (Database is missing, but Olsen has data)
+	66 data values exist (Database has data, but Olsen has missing)
+	<u>551 non-matched values</u> (Database and Olsen's Excel Files differ)
=	14,898 values

85. To summarize, of the 915 missing values that Dr. Olsen had, we found only 849 missing values – the remaining 66 were decreed by Dr. Olsen to be missing when they in fact had data. In addition, there are 499 additional values that were missing data in the Access database, but which suddenly have data in Dr. Olsen's analysis file. Finally, there are 551 values in the dataset where the value in the Excel file used for analysis differed from the original values in the Access database. In total, there are over 1,000 cells in Dr. Olsen's analysis database that do not correspond to the original data. This is about 7.5% of the total data that is in error or changed in some manner. This calls into question any quality of any analysis or data used by Dr. Olsen. Additionally, the 1,116 cells that have discrepancies are only one part of the problem. There is also a significant amount of data thrown away or ignored for no discernable reason.

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87. Dr. Olsen calculates his PCA scores in Appendix F of the CDM report in an Excel sheet ("To calculate a PC score for each individual sample, the PC coefficient is multiplied by the standardized parameter concentration. This is performed for all parameters (variables) (*sic*¹⁶) in a particular PCA run. The product values for all 25 (*sic*¹⁷) parameters are summed to yield one PC score for each sample for each PC. Hence, a particular sample will have both a PC1 and a PC2 score").¹⁸ We reproduced Dr. Olsen's PCA scores in the following manner.

88. Start with the original SW3 data for the 26 variables. Missing values are replaced with the means of the variables before taking the logarithms. Compute z-transformations (subtract the mean of a variable, divide by its standard deviation) on these original variables. Multiply the SW3 z-transformed variables by the first two sets of coefficients produced from Dr. Olsen's PCA on the SW3 log base ten data, ignoring the remaining sets of PCA coefficients. This produces two variables with 573 observations each. The 573 observations are the EDA_Samples (S1,, S573). The two variables are PC1 and PC2.

89. To calculate PC1 for the first EDA_Sample "S1", find the minimum value of the PC1 column, take the absolute value of the minimum value, add 1 to this value, then add the value of the first EDA_Sample. This method does not correspond to any standard PCA methodology.

¹⁶ Dr. Olsen throughout his report confuses the terms parameter and variable. In this sentence he uses one to explain the other. From context, it seems that Dr. Olsen means variable when he says parameter. A parameter is a single value that describes a characteristic of a population, like an arithmetic mean or a variance. A variable is a theoretical construct used to denote a value that can change according to the sample being observed. These are not interchangeable terms.

¹⁷ There are 26 variables in Dr. Olsen's analysis, not 25.

¹⁸ Dr. Olsen's calculations are described on page 6-53 in the CDM report

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APPENDIX 1: PAST EXPERIENCE

My background covers 30 years of research and study in the areas of statistics, economics, and their application to business problems. I am Managing Partner of Analytic Focus LLC, a company headquartered in Birmingham, Alabama. A portion of our work is conducting research in legal issues, including providing litigation support and expert witness services when requested. Some of our work focuses on measurement and mitigation of risk for financial intermediaries. The final area of our practice is in support of Federal and State agencies needing economic and financial analysis to pursue their missions. I am also a research professor in the School of Business and the School of Public Health at the University of Alabama – Birmingham.

In litigation, our firm has focused on class certification issues, intellectual property, antitrust, and regulatory compliance. In banking and insurance, we offer services regarding audit reliability, risk measurement, model validation, and optimization of operations. For regulatory agencies, we have contracts with several Federal agencies to determine risk to funds managed by the agencies or operations conducted by the agencies.

Prior to founding Analytic Focus, I was a director for ARPC, a firm in Washington, DC where I provided many of the same services currently offered by Analytic Focus. From the beginning of 1997 through the end of 1999, I was a Director for Price Waterhouse and subsequently PricewaterhouseCoopers. In this position I headed up two different staff groups, one the financial research group in the Survey Research Center (SRC) run by Price Waterhouse, the other the data mining group. Our research efforts in the SRC was in support of business to business consumer research and financial analysis and for the Federal Government to research regulatory impact. In the data mining group we provided fraud detection services for financial services organizations, optimization research for businesses concerned with supply chain issues in production, and analysis of delivery systems for a number of major delivery companies. This latter work required coordination with our supply chain group and the three directors in charge of these operations formed an "Analytical Trust" where we worked jointly on the statistical and financial aspects of the design for these programs. On the whole, we combined resources in this small group in operations research, statistics, mathematical economics, finance, and system design to answer complex analytical questions.

Before joining Price Waterhouse, I was Chief Statistician for the Federal Deposit Insurance Corporation and the Resolution Trust Corporation, where I was responsible for all research on valuation of properties and assets taken in by the FDIC and RTC in the banking crisis of the 1980s and 1990s. I also supported research into fraud, optimization of contracts with servicing companies, and consumer perceptions of their interactions with banks and savings and loans. I prepared and jointly presented results on the FDIC's consumer research to Congress, specifically the House Banking Committee in hearings on how consumers perceive what they are told regarding retail transactions in banks.

During this time, 1991 to 1996, I also served on a number of independent review committees for different Federal agencies to evaluate the quality of research conducted or research proposed for the National Institutes of Health, for the Department of Health and Human Services, for the Department of Justice, for Treasury, and for the Department of Agriculture. These committees were formed specifically to determine how to determine whether research presented to the Federal government could support conclusions drawn or to consider whether research proposed in grant applications would be adequate to study the topic in question.

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I also worked for a time in the private sector as Chief Statistician and a Vice President for Opinion Research Corporation, from 1989 through 1991. In this position I helped design over 100 consumer research studies focusing on acceptance of new products, pricing, and customer satisfaction. In particular I helped to design the largest ongoing customer satisfaction study conducted in the United States for the U.S. Postal Service to investigate all aspects of consumer reactions to operations of and interactions with the Postal Service.

From 1986 through 1989, I was the first Chief Statistician for the newly founded National Center for Education Statistics, an agency within the Department of Education. As the Chief Statistician I was responsible for the design of all surveys and research conducted by NCES, reports to Congress on the state of education in the U.S. and in the world, and on staff development in research methods. In particular, under my guidance, NCES was one of the first Federal statistical agencies to publish standards for operations and research. These standards are still required for the conduct of research by all NCES staff and all contractors working with the NCES.

From 1975 through 1986 I held a variety of positions at the U.S. Bureau of the Census, including Chief of the Survey Design Branch, where I was responsible for the technical aspects of all research conducted on the evaluation of surveys and the 1980 Decennial Census. I also designed research studies on the validity of surveys conducted by the Census Bureau, experiments to measure response validity, and helped a number of countries develop research programs regarding their economic and demographic research programs.

My first positions after graduation were with the Institute for Social Research at the University of Michigan and as Manager of the Survey Research Center at Oregon State University.

During this time I served on a number of different committees in professional associations including the American Statistical Association, the American Association for Public Opinion Research, and the Research Industry Coalition, including the presidency of the latter. For each of these associations I was involved in issues of ethics and professional standards in the research community.

I have also served as an adjunct or visiting professor at a number of universities, besides my current positions as an adjunct at UAB. I have also been an adjunct professor teaching statistics at the George Washington University and a visiting research professor at the University of Illinois.

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APPENDIX 2: RESUME OF CHARLES D. COWAN

Key Qualifications

Charles D. Cowan is Managing Partner of ANALYTIC FOCUS LLC. Dr. Cowan has 30 years of experience in statistical research and design. He consults for numerous public and private sector entities on the design, implementation, and evaluation of research and the synthesis of statistical and sampling techniques for measurement.

Dr. Cowan has designed some of the largest and most complex research programs conducted by the Federal Government, including the Post Enumeration Program conducted by the Bureau of the Census to evaluate the 1980 Decennial Census, the Economic Cash Recovery valuations conducted by the Resolution Trust Corporation in 1990-95, and many evaluation studies conducted for the Justice Department, the Department of Defense, the Department of Housing and Urban Development, and the Treasury Department. He has provided expert advice to corporations and government agencies on the incorporation of complex research designs in demographic and economic measurement problems, including:

- Development of procedures used by the Resolution Trust Corporation and the FDIC for determination of the value of all assets held by the RTC\FDIC taken from failed banks and S&Ls. Results from this research were used in quarterly reports to Congress on the loss to the American taxpayer that resulted from these failures. These estimates of anticipated recoveries on assets were also used by the RTC and FDIC for financial reporting, leading these agencies to their first clean opinions from the GAO in their annual review of agency financial statements.
- Establishment of audit and sampling methods to determine the completeness and reliability of reporting and record systems. These procedures were used to both expand and streamline bank examinations for safety and soundness and also compliance measurement for the FDIC. These sampling techniques are applied in the audit of Federal agencies concerned with regulatory review of operations and systems, and related systems for banks, regulatory agencies, and law firms;
- Application of econometric and biometric procedures for measurement of credit risk in large portfolios of loans. These models are frequently used for a variety of purposes within financial institutions, such as the pricing of loans, the management of customers long term, decision making on workouts for delinquent loans, and for establishment of economic and regulatory reserves.
- Evaluation of research conducted for the Department of Defense, for the National Institutes of Health, and for the Department of Agriculture, each in response to Congressional inquiries on the validity of published results, and also for defendants in lawsuits involving evidence proffered by plaintiffs in furtherance of their suit.
- Model fitting and development of projection methods to measure the likelihood of loss or errors in recording in loans held by banks or put up for auction; measurement of the likelihood of fraud and/or noncompliance in systems, including bank holding companies, trading activities for brokers, and systems for compliance with health department and judicial requirements;

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- Incorporation of population demographic models with financial assessment models to predict risk for insurance companies and corporations in terms of number and value of potential claims in mass tort litigation.
- Development of procedures used by the Bureau of the Census for apportionment of population for revenue sharing purposes and the estimation of the undercount in the Decennial Census of Population and Housing. These procedures include application of capture-recapture methods to measure the size of the undercount in the decennial census, use of network sampling as an alternative measure for population size, and measurement of the reliability of data collected in the Census.
- Development of statistical methods to quantify the size of populations, including nomadic populations for the Census of Somalia, the undercount and overcount in the Census of Egypt, the number of missing children in Chicago, IL, and the number of homeless persons and families needing services in several large cities with transient populations.

Dr. Cowan teaches graduate and undergraduate courses in survey methods, statistics, and computer methods for analysis. He is the co-author of two books, one on evaluation of survey and census methods and one on econometric measures related to the welfare of the U.S. economy. He has written numerous articles on statistical methods, sampling, rare and elusive population research, and optimization techniques.

Prior to cofounding **ANALYTIC FOCUS LLC**, Dr. Cowan was a Director with ARPC and with Price Waterhouse, where he specialized in financial research, survey research, and audit sampling. From 1991 to 1996, Dr. Cowan was the Chief Statistician for the Resolution Trust Corporation and the Federal Deposit Insurance Corporation, where he designed research necessary to measure the loss from the Savings & Loan Crisis of the late 1980's and capitalization requirements for the RTC funds from the U.S. Treasury. Dr. Cowan also served as the Chief Statistician for the U.S. Department of Education, where he designed large-scale surveys of educational institutions to measure resource needs and availability, and for Opinion Research Corporation, where he designed predictive models of demand for automobile manufacturers, banks, and large horizontally diverse firms like GE and AT&T. Dr. Cowan worked for the U.S. Bureau of the Census, where he was the Chief of the Survey Design Branch and developed many of the techniques in use today for the evaluation of coverage in surveys and censuses.

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Education

Ph.D., Mathematical Statistics, The George Washington University, 1984

M.A., Economics, The University of Michigan, 1973

B.A., English and B.A., Economics, The University of Michigan, 1972

Professional Experience

Co-Founder, ANALYTIC FOCUS LLC, January, 2002 to present.

Director, ARPC, November, 1999 to December, 2001.

Director, PricewaterhouseCoopers LLP, January 1997 to November, 1999.

Chief Statistician, Federal Deposit Insurance Corporation / RTC, 1991 to 1996.

Chief Statistician, Opinion Research Corporation, 1989 to 1991.

Chief Statistician, National Center for Education Statistics, US Dept. of Education, 1986 to 1989.

Bureau of the Census: Assistant Division Chief, International Statistical Programs Center, 1984 to 1986; Staff Liaison for Statistical Litigation Support, 1983 to 1984; Chief, Survey Design Branch, Statistical Methods Division, 1978 to 1983; Acting Chief, Survey Analysis and Evaluation Branch, Demographic Surveys Division, 1976 to 1978; Office of the Chief, Statistical Research Division, 1975 to 1976

Survey Research Center, Oregon State University: Manager, 1974 to 1975

Institute for Social Research, U. of Michigan: Assistant Study Director, 1972 to 1974.

Professional Associations

Adjunct Full Professor, Statistics, University of Alabama – Birmingham, 2002-present.

Associate Professor, Statistics, George Washington University, 1993 - 1998.

Visiting Research Professor, Survey Research Laboratory, U. of Illinois, 1983 - 1989.

Consultant, Dept. of Community Psychiatry, Johns Hopkins U., July 1985 - Dec 1987.

Professional Societies – Memberships

American Statistical Association (ASA)

American Association for Public Opinion Research (AAPOR)

International Association of Assessment Officers

Professional Societies - Positions

President, Research Industry Coalition, 1999-2000

Council Member, Research Industry Coalition, Representative from ASA, 1995-2000

President, Washington/Baltimore Chapter of AAPOR, 1998

Program Chair, American Association for Public Opinion Research, 1991-2

Program Chair, Section on Survey Research Methods, ASA, 1989-90

Secretary-Treasurer, AAPOR, 1985-1986

Associate Secretary-Treasurer, AAPOR, 1984-1985

Editorial Board, Public Opinion Quarterly, 1980-1984

Editorial Board, Marketing Research, 1989-2000

Chair, Conference Committee, AAPOR, 1982-1989

Chair, Committee on Privacy and Confidentiality, ASA, 1980-1981

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Publications

Strumpel, Burkhard; Cowan, Charles; Juster, F. Thomas; and Schmiedeskamp, Jay; editors, Surveys of Consumers 1972-73, Contributions to Behavioral Economics, Ann Arbor: The Institute for Social Research, 1975.

Duncan, Greg, and Cowan, Charles D., "Labor Market Discrimination and Nonpecuniary Work Rewards" in Surveys of Consumers 1972-73, Contributions to Behavioral Economics, Ann Arbor: The Institute for Social Research, 1975.

Curtin, Richard T. and Cowan, Charles D. "Public Attitudes Toward Fiscal Progress" in Surveys of Consumers 1972-73, Contributions to Behavioral Economics, Ann Arbor: The Institute for Social Research, 1975.

Cowan, Charles D., and Spoeri, Randall K., "Statistical Distance Measures and Test Site Selection: Some Considerations", Proceedings of the Computer Science and Statistics: Eleventh Annual Symposium on the Interface, 1978.

Bushery, John R., Cowan, Charles D., and Murphy, Linda R., "Experiments in Telephone-Personal Visit Surveys", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1978.

Spoeri, Randall K., and Cowan, Charles D., "On the Use of Distance Measures in Test Site Selection: A Practical Application Using Census Data", Proceedings of the American Statistical Association, Section on Business and Economic Statistics, 1978.

Hogan, Howard, and Cowan, Charles D., "Imputations, Response Errors, and Matching in Dual System Estimation", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1980.

Schwartz, Sidney H., Cowan, Charles D., and Sausman, Kenneth R., "Optimization in the Design of a Large-Scale State Sample", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1980.

Cowan, Charles D., "Modifications to Capture-Recapture Estimation in the Presence of Errors in the Data" presented at the meetings of the American Statistical Association, Biometrics Section, 1982 (no proceedings).

Cowan, Charles D. "Interviews and Interviewing", The Social Science Encyclopedia, Routledge and Kegan Paul, Publishers, The Netherlands, 1984.

Wei, L. J. and Cowan, Charles D. "Selection Bias", Encyclopedia of Statistical Science, John Wiley and Sons, New York, N.Y., 1984.

Cowan, Charles D. and Malec, Donald J. "Capture-Recapture Models When Both Sources Have Clustered Observations", Journal of the American Statistical Association, June 1986, Vol. 81, # 394, pp. 347-353, and Proceedings of the American Statistical Association, Section on Survey Research Methods, 1984.

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Cowan, Charles D. The Effects of Misclassification on Estimates from Capture-Recapture Studies. Unpublished doctoral dissertation, The George Washington University, September 1984.

Cowan, Charles D. "Misclassification of Categorical Data", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1985.

Cowan, Charles D., Biemer, Paul P., Magnani, Robert J., and Turner, Anthony G., Evaluating Censuses of Population and Housing, Statistical Training Document, ISP-TR-5, U.S. Department of Commerce, Bureau of the Census, 1985.

Cowan, Charles D., Turner, Anthony G., and Stanecki, Karen "Design of the Somali Post Enumeration Survey (1986-1987)", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1986.

Cowan, Charles D., Breakey, William R., and Fischer, Pamela J. "The Methodology of Counting the Homeless", Proceedings of the American Statistical Association, Section on Survey Research Methods, 1986.

Cowan, Charles D. and Malec, Donald J. "Sample Allocation for a Multistage, Multilevel, Multivariate Survey", Proceedings of the Fourth Annual Research Conference (ARC IV), U.S. Bureau of the Census, 1988.

Frey, Carolin M., McMillen, Marilyn M., Cowan, Charles D., Horm, John W., and Kessler, Larry G.. "Representativeness of the Surveillance, Epidemiology, and End Results Program Data: Recent Trends in Mortality Rates", Journal of the National Cancer Institute, Vol. 84, No. 11, June 3, 1992.

Cowan, Charles D., Breakey, William R., and Fischer, Pamela J. "The Methodology of Counting the Homeless, A Review" in Homelessness, Health, and Human Needs. Institute of Medicine, National Academy Press, National Academy of Sciences, Washington, D.C., 1988.

Cowan, Charles D., "Standards for Statistical Surveys in the Federal Government: Practices in the Center for Education Statistics", Proceedings of the American Statistical Association, Section on Survey Methods Research, 1988.

Sudman, Seymour, Sirken, Monroe G., and Cowan, Charles D., "Sampling Rare and Elusive Populations", Science, Vol. 240, pp. 991-996, May 20, 1988.

Cowan, Charles D., "Mall Intercepts and Clinical Trials: The Philosophy of Inference from Different Types of Research Designs" in Marketing Research: A Magazine of Management & Applications, Vol. 1, No. 1, March 1989.

Cowan, Charles D., "Mall Intercepts: Principles of Design for Research" in Proceedings of the Seventh Annual Advertising Research Foundation Research Quality Workshop, September, 1989.

Cowan, Charles D., "Estimating Census and Survey Undercounts Through Multiple Service Contacts" in Housing Policy Debate: Counting the Homeless: The Methodologies, Policies, and Social Significance Behind the Numbers, Volume 2, Issue 3, pp. 869-882, 1991.

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Cowan, Charles D., "Ratio vs. Regression Estimators in a Large Scale Survey of S&L's" in Proceedings of the Section on Survey Research Methods, American Statistical Association, 1992.

Cowan, Charles D., "A Longitudinal Survey and Reality Check for the Value of Financial Assets" in Proceedings of Statistics Canada Symposium 92: Design and Analysis of Longitudinal Surveys, November 1992.

Cowan, Charles D., and Wittes, Janet, "Intercept Studies, Clinical Trials, and Cluster Experiments: To Whom Can We Extrapolate?" in Controlled Clinical Trials, Vol.15, pp.24-29, 1994.

Cowan, Charles D., and Klena, Matthew K. "Use of the EM Algorithm for Allocation of Proceeds from Auctions and Bulk Sales" in Proceedings of the Section on Business and Economic Statistics, American Statistical Association, 1995.

Cowan, Charles D., "Coverage, Sample Design, and Weighting in Three Federal Surveys" in Journal of Drug Issues, October, 2001.

Cowan, Charles D., "Use of Mass Appraisals in Toxic Tort Litigation Involving Loss of Value" in Proceedings of the International Association of Assessment Officers, October, 2002.

Cowan, Adrian M. and Cowan, Charles D., "Default Correlation: An Empirical Investigation of a Subprime Lender", The Journal of Banking and Finance, March 2004.

Cowan, Charles D. and Cowan, Adrian M., "A Survey Based Assessment of Financial Institution Use of Credit Scoring for Small Business Lending", SBA Report 283, Nov. 2006

Keith, Scott W. , Wang, Chenxi, Fontaine, Kevin R. , Cowan, Charles D. and Allison, David B. , "Body Mass Index and Headache Among Women: Results From 11 Epidemiologic Datasets", Obesity, Volume 16, Issue 2 (February 2008) 16: 377-383; doi:10.1038/oby.2007.32

Cowan, Charles D., and Cowan, Adrian M., "Quasi-Likelihood Estimation of Loan Portfolio Defaults in the Presence of Default Correlation and Autocorrelation", The European Journal of Finance (forthcoming, 2009)

Brock, David W., Thomas, Olivia, Cowan, Charles D., Hunter, Gary R., Gaesser, Glenn A., and Allison, David B., Association between Physical Inactivity and Prevalence of Obesity in the United States, Journal of Physical Activity and Health, (forthcoming, January, 2009)

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APPENDIX 3: PAST TESTIMONY

Trademark Infringement:

Quiksilver v. Brunswick, circa 1997. Deposed, case settled. Worked for the defendant, who had started producing t-shirts under brand name Quicksilver, one of their boat lines. The boat line could be named Quicksilver, but Quiksilver produces "surfer" clothes and were concerned about trademark confusion. We conducted a survey to determine level of confusion and the likely damages caused. Brunswick dropped the t-shirt line and settled.

St. Johns Knits versus St. Johns, circa 1997. Deposed, case settled. Small firm in California named itself St. Johns and began to produce ladies casual apparel with name of St. Johns. Worked for plaintiff, conducting survey on trademark confusion and calculating damages.

Nitro Leisure Products v. Acushnet. **Antitrust**, Trademark, and Deceptive Sales Practices filed in Florida. Deposition in 2003, settled in 2004. Worked for defendant. Issue was whether claims regarding the performance of "used and repackaged" golf balls were valid. Survey – conducted, used to support damage claims. Second simultaneous suit was Acushnet v. Nitro – work used in settlement of the two simultaneously.

Community First Bank v. Community Banks. Trademark infringement. Deposition, October, 2004. Worked for Defendant. Issue was that Pennsylvania based Community Banks, a multi-state bank, opened branches in Northern Maryland. Community First Bank claimed it already had a charter in Maryland and the intrusion of Community Banks diminished the value of their name. Case resolved in favor of Defendant – dismissal on Summary Judgment.

Trade Dress

Sound Board Manufacturer v. European Manufacturer. Trade dress infringement. Worked for plaintiff. Circa 1997. Issue was that European manufacturer bought a sound board from U. S. manufacturer, reverse engineered it, and sold their copy with exactly same layout and design in competition with U.S. manufacturer. Conducted survey of bands, churches, small recording studios, and other potential purchasers of mid-price sound boards. Case settled.

Guntersville Breathables v. Kappler. Trade dress infringement. Worked for plaintiff. 2004. A manufacturer of camouflage hunting clothes developed a unique camouflage design and used it for their primary line of clothes. A second manufacturer bought materials from same fabric company and produced exactly the same design for hunting clothes sold in similar outlets to the same population of hunters. Survey designed and implemented. Case settled.

VPX v. ABB. Trade dress infringement. Worked for defendant. 2006-7. A manufacturer of liquid energy drinks sold in gyms, health clubs, and big box retailers filed suit against another manufacturer of liquid energy drinks, claiming that the shape and type on the bottles of the defendant were the same as that of the plaintiffs and caused confusion among potential purchasers. Conducted surveys of potential purchasers of liquid energy drinks to determine whether confusion exists. Deposition in January, 2007, testimony in bench trial in January, 2007. Defendant won.

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Patent Infringement:

Smith & Nephew v. Zimmer, circa 1999. Deposed, then case settled. Worked for defendant who admitted infringing on patent but claimed that the particular feature upon which they infringed was not important to the choice of the product by physicians. Product was hip replacement "cup" and "stem", and feature was machining of cup to minimize friction. We conducted a survey of physicians to determine what features were important to the selection of a hip replacement part. We used the survey to calculate damages; results were used in the settlement deliberations.

Design Patent Infringement:

Leatt v. Alpinestar. Worked for Plaintiff. Leatt has a design patent on a neck brace used in active sports like Motocross and has successfully defended their patent against imitators. Alpinestar produced a new neck brace allegedly based on the Leatt design. Conducted a survey to establish whether confusion existed regarding whether the designs between the two neck braces were considered to be the same or substantially the same. Case on-going.

Deceptive Sales Practices:

Executech v. Appleton Papers, circa 1998. Deposed, testified at class certification hearing. Class denied. Issue was whether Appleton Papers colluded with other manufacturers in the pricing of thermal fax paper products. Appleton had already won an antitrust case in Federal court on same issue. Conducted survey of pricing of product throughout Florida and proved that pricing of product was so discretionary at retail level that it was impossible to consider whether producer pricing had claimed impact at retail level. Case cited by Third District Court in Florida when tobacco class ruling in Florida was overturned on appeal.

Watkins et al. v. Dry Cleaners International, 2003. Not deposed, case settled before class hearing. Worked for defendant. Issue was whether DCI had properly informed customers of surcharge imposed to cover environmental costs. Plaintiffs claimed customers were confused and thought charge was improperly imposed tax. Survey conducted, damages calculated.

Fidelity Mortgage v. Seattle Times. Deceptive Trade Practices in Seattle Washington. Deposition in 2004. Worked for plaintiff. Damages calculated on lost sales because of publication of false interest rates. Case in appeals court.

Irena Medavoy v. Arnold Klein, M.D. et al.. Deceptive Sales practices case in California involving Botox, representing the cosmetics manufacturer. Worked for defendant. Deposed in 2004, case dismissed.

Disparate Impact \ Discrimination

Apkins et al. v. Atlantic Marine – Mobile. Loss of jobs, loss of work hours, lack of promotions for population of blacks working for a manufacturer who laid off blacks first, re-hired (called back) blacks last, refused to promote, and kept overtime for only certain workers. Worked for plaintiffs. Analysis of hiring practices, lay off records, filings with Federal government, and other records to develop pattern of practice analysis. Case settled, no testimony.

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Disparate impact in promotions for minority workers for a large public utility. Worked for plaintiffs. Analysis of testing and promotion procedures, development of methods to ascertain if skill tests used led to disparate treatment of minorities. Report submitted, case ongoing.

HOPE v. Illinois Chinese American Residence for the Elderly. Disparate impact for senior citizens for a public housing authority. Worked for city housing authority – plaintiff. Survey of senior citizens in a city to determine their attitudes and beliefs regarding different Federally sponsored senior citizen independent living facilities. Analysis of demography of general population in the city and comparison to distributions of residents in all independent living facilities in the city. Report and affidavit submitted, case ongoing.

Stein et al v. SLG Group. Disparate impact for minorities in availability of cemetery plots in multiple cemeteries owned by single holding company under the Fair Housing Act. Analysis of sales of plots to individuals to ascertain whether a pattern of practice existed. Worked for defendant. Case settled.

AHF COMMUNITY DEVELOPMENT v. City of Dallas. Disparate impact for minorities and families under the Fair Housing Act. Code inspections by police in the City of Dallas allegedly caused disruption and loss of fair use of housing in an affordable housing complex. Analysis of business reasons under HUD guidelines for all code inspections conducted by police and analysis of discriminatory and disparate impacts on residents. Deposition, July 2008. Case ongoing.

Mississippi Home Builders v. City of Brandon, Mississippi. Disparate impact for minorities and families under the Fair Housing Act. The City of Brandon, Mississippi is defendant in a case where the Homebuilders of Mississippi allege a new city ordinance has a disparate impact on minorities. The ordinance establishes a minimum for the size of new homes built in the city and the claim is that the minimum causes prices to be too high for new homes, having a disparate impact on minorities. Worked for defendant. Deposition, August 2008. Case ongoing.

Toxic Tort:

Three separate **Toxic Tort** property value diminution cases filed in Florida between 1998 and the present. Deposition for the largest and latest case in 2001. All three cases were environmental contamination cases, with class actions brought against manufacturer. Worked for defense in all three cases on class certification issues and damages calculations. Deposed in last case, First Case class was not certified, Second case settled. Third: Bernice Samples, et al, v. Conoco, Inc.; Agrico Chemical Company; and Escambia Treating in the Circuit Court of the First Judicial Circuit in and for Escambia County, FL, Division: "J", June 2002, Deposition; Case settled.

Other Antitrust:

North Jackson Pharmacy, Inc. et al v. Express Scripts, Inc. et al. Independent Pharmacies filed an antitrust case against Pharmacy Benefit Managers (PBMs). Worked for plaintiffs. Deposed in July, 2005; class certified.

North Jackson Pharmacy, Inc. et al v. Caremark Pharmacies filed an antitrust case against Pharmacy Benefit Managers (PBMs). Worked for plaintiffs. Deposed in May, 2006; class certification pending.

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Other cases:

Castro v. Ford Motor, Inc. **Wrongful Death** Suit filed in California. Deposition and Testimony in 2001. Worked for defendant. Survey used in case regarding use of Ford Explorers by the general public. Critiqued survey and damages calculations as rebuttal expert. Jury found in favor of Ford.

Mullinax v. Buffalo Rock. **Wrongful Death** Suit in Alabama. Deposition and Testimony in 2004. Worked for plaintiff. Sampling of trucks from Pepsi bottling plant taken and analyzed to demonstrate that Pepsi \ Buffalo Rock drivers frequently speed, even after plaintiffs mother was killed by speeding fully loaded truck. Results were that 70 to 80 percent of trucks were observed speeding during a three month period, and 90 percent of "roll-up" trucks were speeding during this period. Jury found in favor of plaintiff with sizable award.

BMW Management, Inc. v. Sizzler, Inc.. Lost value and population estimates for population affected in a marketing case where a franchisor allowed a new franchise to be built in the "blocked area" around an already existing franchise. Worked for plaintiff. Case settled – deposition, January 2006.

Silver Pines Homeowners Association et al. v. Silver Pine Builders et al. **Construction Defects** Damages case regarding the calculation of damages based on a sample of housing units inspected and resulting damages extrapolated to the full population of units built in a new subdivision. Worked for defense. Case settled – deposition, May 2007.

Fair Labor Standards Act (FLSA) case filed against Dollar General involving claims for overtime not paid for store managers. Analysis of hours worked, duties performed, activity types. Case initially resolved in Summary Judgment against plaintiffs. On appeal reestablished and awaiting trial. Deposition, July 2007.

DA-HEEM RODGERS, ET AL. V. AVERITT EXPRESS, INC., **Fair Labor Standards Act (FLSA) class action**, case involving claims for overtime not paid for truck drivers. Analysis based on travel patterns and frequency of involvement in interstate commerce and damages calculation. Worked for plaintiffs. Case ongoing – deposition, June, 2008.